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ABSTRACT

A 52-point questionnaire was developed to evaluate the success of each of 270 device/client matches at the Technical Resource Centre in Calgary, Alberta. The center provides physically handicapped persons with any of over 200 devices in the areas of communication, mobility, environmental control, and computer evaluation. The first questionnaire items describe the age, cognitive and physical skills of the client, and the number of hours of device use per week. The remaining items ask the respondent (client, therapist, or family member) to evaluate the device/client matches. Findings are presented that identify the critical factors from the questionnaire: effect on the user, effects on others in the environment, level of training in the operation of the device, design of the device, and device reliability and durability. The questionnaire itself is appended. (Author/DB)

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Critical Factors in the Prescription of Technical Aids

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Abstract

A 52 point questionnaire was developed to evaluate the success of each of 270 device/client matches through the Technical Resource Centre in Calgary, Alberta. The first seven items described the age, cognitive and physical skills, and the number of hours of use per week. The next 38 points asked the evaluator (client, therapist, or family member) to respond on a scale from 1 to 5 to evaluate the device/client matches. The remaining items allowed more open-ended evaluations of devices. Findings are presented that identify the critical factors from the hypothesized list: effect on the user, effects on others in the environment, level of training in its operation, design of the device, and device reliability/durability. Suggestions are made to agencies and institutions that are considering the purchase of devices.

The Technical Resource Centre (TRC) is a non-profit agency supported by the United Way and the Cerebral Palsy Association of Calgary. Over 200 devices are available through TRC in the areas of communication, mobility, environmental control, and computer evaluation for the physically handicapped. Six individual services are offered at the TRC. (a) A therapist or client can access information through the library, which includes books, brochures, and journals on virtually every kind of technical aid available. (b) A therapist can consult with device specialists and therapists about a specific client's technical aid needs. (c) In the device assessment service, a client's physical and cognitive skills and personal goals can be matched to an assistive device. (d) The client and/or others can receive training in the use of a device. (e) The TRC provides monthly general orientations to the Centre, customized orientations, tours for specific groups, and a series of day long workshops in the areas of microswitches, computer applications, augmentative communication, aids to daily living, and environmental control. (f) As well, equipment can be loaned to clients after completion of an interview, consultation, or full client assessment if a trial evaluation is recommended by TRC staff.

The purpose of this paper is to analyze the results of loans made by TRC and to describe the significant or critical factors causing the success or failure of device/client matches.

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Method

When TRC staff recommended the trial evaluation of a technical device, if available, the device was loaned in order to test its use in the "real" environment. The client and others in the environment were given basic training in the use of the device, an appropriate battery charging schedule and instructions, as well as suggestions to trainers for programming with the client in specific environments. The loan period was usually four weeks.

At the end of the trial loan period, the equipment was returned and a Follow-up Evaluation Form[1] (see appendix) was completed, usually by the therapist (50%), less frequently by the client or a family member, to determine the appropriateness of the device/client match.

The first seven questions of the form (1 to 7) identified the device, the client, and estimates of degree of cognitive and physical ability.

The next 38 questions were grouped into six categories or hypothesized factors (Harris-Vanderheiden, 1975; Lynwood & Symington, 1978; Vanderheiden, 1981). Responses were made by circling 5 for a very positive answer, 1 for a very negative answer, and 3 for neutral or not applicable. Factors and their related questions were durability and reliability (11, 13, 16); design of the aid (12, 14, 15, 17, 18); training and operation (8, 9, 10, 19, 20); decision to purchase (27, 28, 29); effects on others (22, 23, 25, 26, 42, 43, 44, 45); effects on the user (21, 24, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41). Items 46 and 47 related to the length of the loan period and any other aids used by the client. The last 5 questions (48, 49, 50, 51, 52) allowed for more open-ended responses. They gave the opportunity for the user and those in the environment to comment and make suggestions about the device in general or to more fully explain how it made or did not make a change in the user's life.

The numbered responses were averaged and the resulting score was considered an indication of the usefulness of the device recommended for that client. Analysis was done for 270 evaluations completed over four years, including 108 evaluations from an earlier study (Saya, 1985).

Results and Discussion

The following represent some of the most interesting and significant findings of the data analysis. The subjects were fairly equally divided between children (47%) and adults (53%) with a fairly even spread across age groups, from the infant and pre-school group (17%) to the geriatric group (16%).

For the sample, 83% of the group were physically handicapped and 6% demonstrated some motor delay. Over one third of the group (34%)

had cerebral palsy as the primary diagnosis. Neuromotor disorders such as Muscular Dystrophy, Multiple Sclerosis, and ALS (Amyotrophic Lateral Sclerosis) affected 21% of the group; spinal cord injury and closed head injury resulting in quadriplegia, paraplegia, or hemiplegia affected 24% of the group. Three percent of the subjects were physically and cognitively normal but had no functional speech. A final category (18%) included those children and adults with blindness, deafness, mental handicap, arthritis, amputation, and so forth. A full two thirds of the group had normal cognition. Parents, teachers, or therapists rated 33% of the group as cognitively delayed or as unknown.[2]

Aids to communication (95) and aids to daily living (68) were the two largest groups of devices loaned and evaluated. Evaluations of computer equipment have been done separately and were not included in this study (Technical Resource Centre, 1986).

Other data gathered included the average total hours devices were reported used during the one month loan period. For communication devices, average total hours were 10.5; for aids to daily living, 16.9; adapted toys, 5.3; and aids to mobility, 26.6.

From this data, the following are suggested as required minimum hours of use before making a decision about the appropriateness of the device: 10 hours of use for communication aids; 17 hours of use for aids to daily living (e.g., 17 meals on an eating device); 5 hours with adapted toys; 26 hours at least one hour every day for a month with aids to mobility (environmental controls).

If the overall evaluation score averaged around 4.0 for a device, there was a very strong suggestion that the device should be purchased or used on a long term basis. If the score averaged around 2.0, there were serious difficulties with and possibly a strong rejection of the device. This suggested a closer look at the situation and re-evaluation or modification of the use of the device. If the score averaged around 3.0, then the evaluation was inconclusive. This suggested that the evaluation period should be increased, that training might become more detailed, or that the device was not making any real difference to the client and others in the environment.

The average ratings for the technical aids over all raters give an indication of their overall usefulness to the subjects evaluated. To illustrate, the Form-A-Phrase communication device was rated a 2 (a relatively low rating); the Enco was rated a 4 (a relatively high rating) the page turners were rated 3.17 (which is not much above neutral). Table 1 provides ratings for a number of evaluated devices.

It is important to consider who is answering the evaluation questions and from what point of view. For example, a teacher may be answering from the point of view of the classroom only, where the device is seldom

Table 1
Rank Ordering of Devices with Respect to Frequency of Loan and Overall Rating of Devices

Frequency	Device	Rating
34	Sharp Memowriter	3.71
27	Toys and Switches	3.90
25	Aids to Eating	3.76
21	Phone Adaptations	3.90
16	Call Signals	3.75
14	Canon Communicators	3.57
14	Handivoices	3.21
12	Computer Peripherals	3.92
11	Zygo 16/100 Scanners	3.45
9	Rotary Scanners	3.44
9	Vocaids	3.55
7	Ultra IVs	3.71
6	Electric Carts	3.67
6	Page Turners	3.17
4	Enco	4.00
4	Express III	3.50
4	Light Beam Pointers	4.00
4	Message Selectors	3.50
4	Mouth/Head Sticks	3.00
4	Adult 3P Wheelchair	3.50
4	Voice Amplifiers	3.25
3	Able Tables	3.00
3	E-Tran Frames	3.67
3	Nolan Bath Chairs	4.00
3	Row Cars	3.67
2	VIP Communicator	3.50
2	Amigo Chairs	4.50
1	Form-A-Phrase	2.00

Note: The overall rating was calculated from the averages of each evaluation and is out of a maximum of 5.00. Not all devices are listed in this table.

used, but a staff person in residence or a parent at home may answer the questions very differently.

Responses to questions 21 and 28 differed significantly. For communication devices, the majority said that the device was suitable (45 Yes, 33 No). But if the respondents were asked, "Should the device be purchased?", then the majority said, "No" (28 Yes, 50 No). They were basing their "No" answer on the high cost of the device. This may be cost efficient, but one must question the fairness of the decision to the handicapped user. The same trends applied to all other categories of devices.

It should be noted that even after four weeks of evaluation many users or their guardians were unsure about a device. Clearly "one shot" assessments and prescriptions are to be avoided. Usually, problems arose because therapists, teachers, or parents over-estimated the client's skills or under-estimated the cognitive demands of the device.

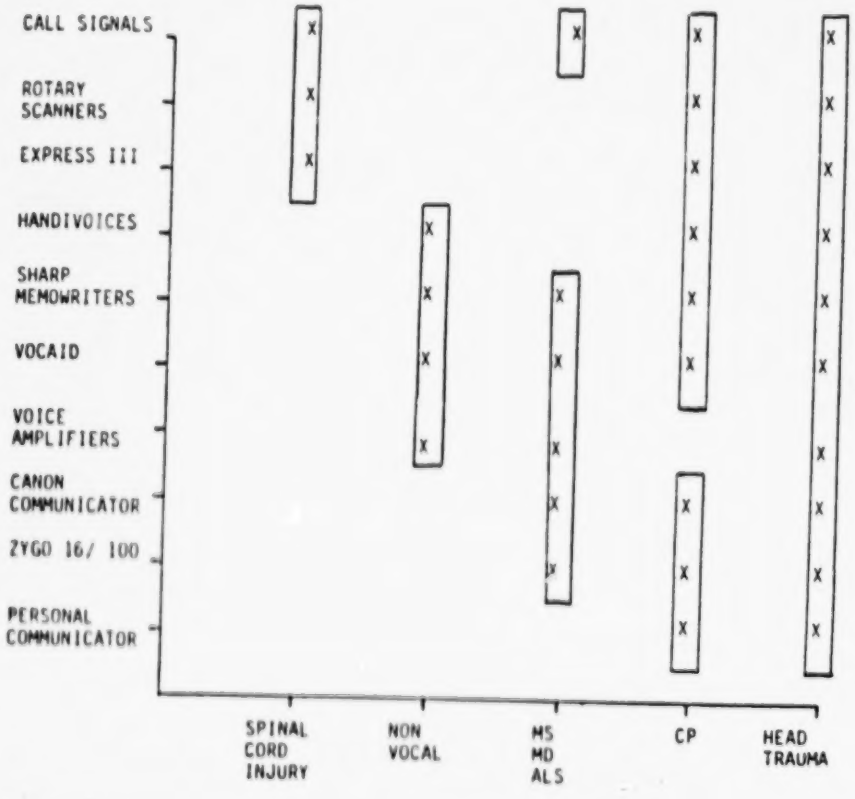

Figure 1: communication devices matched with appropriate physical disabilities

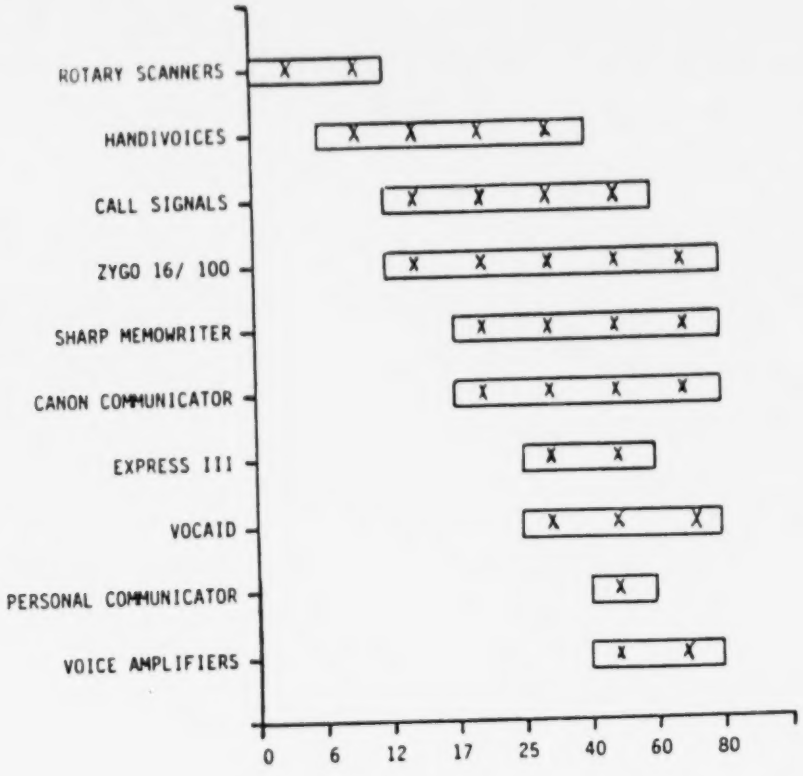

Figure 2: communication devices and age ranges representing 75% of users

The results of correlation studies (Saya, 1985) were that only two factors were significant: the effects on the user and the effects on others in the environment. This implies that even though the device was for the use of the client, the effects on others in the environment were equally important. In fact, with communication devices, what the listener thought of the device was apparently more important than what the client thought! Such considerations as durability, reliability, degree of training, design of the device, and so on; were not found to be significant factors. It is postulated that this is a result of two trends.

1: The Technical Resource Centre very carefully selects the devices available commercially (very few are made at the Centre). Therefore, those that are unreliable or poorly designed have been avoided.

2. There is an extensive and detailed assessment of the potential user and his environment. Thus the trial loan serves to proye that the

best possible match has been made or that there is a need for further information gathering and training.

For agencies or departments considering the purchase of technical aids for their programs, Figures 1 and 2 can be used to suggest the most appropriate selection of devices for specific populations by age or by diagnosis. For example, for those working with high spinal cord injury patients, the use of call signals, scanning devices, and the Express III (or the Light Talker) is warranted. Similarly, those populations in the age range 0 - 12 years would utilize the rotary scanners and Handivoices but few of the other communication aids listed.

Notes

1. The form was developed based on questionnaires from the following sources: Chedoke/McMaster Device Evaluation Centre, Hamilton; Assistive Device Centre, Sacramento; Bliss Communication Institute, Toronto; Kinsmen Centre, Vancouver; Project Threshold, Rancho Los Amigos; Project Teach, Memphis.
2. TRC is mandated to work with the physically handicapped. Those with mental handicaps but no physical handicap are given second priority and are, therefore, only a small part of this population.

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Appendix

1. Aid being evaluated:

001 Able table
002 Bliss scanner
003 BSR-X-10
004 Call signal
005 Canon Communicator
006 Computers
007 Computer peripherals
008 Dufco Matrix Communicator
009 Eating aids
010 Electric cart
011 Enco IV
012 E-tran frame
013 Form-a-phrase
014 Handivoice
015 Light beam indicator
016 Message Selector
017 Mouthsticks
018 Nolan bathchair
019 Optical stripprinter
020 Q.E.D. page turner
021 Rotary Scanner
022 Row car
023 Roll-o-bliss
024 Roto-table
025 Saltus reader
026 Sharp Memowriter
027 Si-comm
028 Switches
029 Telephone adaptations
030 TV controller
031 TV memory
032 Timer/counter
033 Toys
034 Ultra IV
035 VIC
036 VIP Communicator
037 Vocaid
038 Wheelchair - Amigo
039 Wheelchair - Child-34
040 Wheelchair - Adult-31
041 Wheelchair - LEM
042 Writing aids
043 Zygo scanner
044 Other

2. Client medical diagnosis

1. Amputation
2. Arthrogryposis
3. Arthritis
4. Cancer
5. Cerebral Palsy
6. Communication Impaired
7. Head Trauma
8. Hearing Impaired
9. Mental Handicap
10. Neuromuscular Disorder
11. Spina Bifida
12. Traumatic Cord Injury
13. Visual Impairment
14. Other

3. Client age

1. 0-6 years
2. 7-12 years
3. 13-17 years
4. 18-25 years
5. 26-40 years
6. 41-60 years
7. 61-80 years

4. Client physical skills: 1. Normal 2. Delayed 3. Abnormal

5. Client cognitive skills: 1. Normal 2. Delayed 3. Unknown

6. Client name:

7. Aid was used _____ hours/week

8. Setting the aid up was (difficult) 1 2 3 4 5 (easy)

9. Learning to use the aid was 1 2 3 4 5

10. Operating the aid was 1 2 3 4 5

11. Maintenance of the aid was		1	2	3	4	5	
12. Carrying the aid around was		1	2	3	4	5	
13. Did the aid perform reliably	(no)	1	2	3	4	5	(yes)
14. Is it durable and rugged?		1	2	3	4	5	
15. Does it look OK (size, color, shape)?		1	2	3	4	5	
16. Was it trouble free (no repairs)?		1	2	3	4	5	
17. Is the output OK (sounds, light, printing)?		1	2	3	4	5	
18. Is it flexible, modifiable, versatile?		1	2	3	4	5	
19. Was the TRC Instruction manual helpful?		1	2	3	4	5	
20. Was the manufacturer's manual helpful?		1	2	3	4	5	
21. Was the aid suitable for the user?		1	2	3	4	5	
22. Was the aid accepted by others (family, friends)		1	2	3	4	5	
23. Did the aid fit into the environment well?		1	2	3	4	5	
24. Did the aid meet the expectations of the user?		1	2	3	4	5	
25. Did the aid meet the expectations of the therapist?		1	2	3	4	5	
26. Did the aid meet the expectations of the caregivers?		1	2	3	4	5	
27. Was loan period enough?		1	2	3	4	5	
28. Should the aid be purchased?		1	2	3	4	5	
29. Is there funding available		1	2	3	4	5	
Did the aid improve the user's:	(no)		N/A				(yes)
30. Abilities at work?		1	2	3	4	5	
31. Ability to get a job?		1	2	3	4	5	
32. School work?		1	2	3	4	5	
33. Social life?		1	2	3	4	5	
34. Health?		1	2	3	4	5	
35. Attitude (motivation, self-image)		1	2	3	4	5	
36. Home independence?		1	2	3	4	5	
37. Routine at home?		1	2	3	4	5	

38. Mobility? 1 2 3 4 5
39. Speed? 1 2 3 4 5
40. Accuracy? 1 2 3 4 5
41. Communication 1 2 3 4 5
42. Did the aid improve the caregiver's duties? 1 2 3 4 5
43. Did the aid improve the caregiver's use of time? 1 2 3 4 5
44. Did the aid improve the family's social life? 1 2 3 4 5
45. Did the aid improve the family's health? 1 2 3 4 5
46. Loan period from _____ to _____
47. Other aids used: _____
48. Switch used _____
49. Aid was used in what room(s)? _____
_____
50. Client used the aid to interact with (what/whom)? _____
_____
_____
51. What is the best thing about using this device? _____
_____
_____
52. What is the worst thing about using this device? _____
_____
_____